

Applicants : Hermann Franzen and Joachim Kröll
For : TRANSFER PLANT AND METHOD FOR LOADING
AND UNLOADING CONTAINERS FROM
CONTAINER SHIPS
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In the Specification:

Applicants wish to amend the specification as follows:

Please replace the heading before the first paragraph on page 1 with the following new heading:

Specification BACKGROUND OF THE INVENTION

The invention relates to a transfer plant, especially for loading and unloading containers from container ships at seaports, with a vertical support which is propped up at the land side and on which a horizontal extension arm is braced, which protrudes across the ship that is to be unloaded on the sea side and along which a horizontal conveying device can travel, which cooperates with hoisting and lowering devices that pick up and put down the containers, being arranged at the land and sea side and also on the horizontal extension arm.

Please insert the following heading on page 1, before paragraph 6, as follows:

SUMMARY OF THE INVENTION

The purpose of the present invention is therefore to create a novel design of a transfer plant and a method for loading and unloading of containers, preferably ISO containers, from container ships at seaports, such that the handling performance can be significantly increased and thus the time spent by the container ship at dock can be substantially reduced. At the same time, one should make sure that the crane operator is no longer exposed to the great stresses that arise from the fast acceleration and deceleration and the high speeds of travel of the trolleys. In particular, one goal of the present invention is to automatically perform the overwhelming majority of the unloading and loading process.

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Please replace paragraph 3 on page 2 with the following amended paragraph:

~~In advantageous manner, such~~Such a transfer plant ~~is~~may be supplemented in that at least two horizontal conveying devices are arranged on the horizontal extension arm, which can travel independently of each other between the land-side and sea-side hoisting and lowering devices along the horizontal extension arm.

Please replace paragraphs 5 and 6 on page 2 with the following amended paragraphs:

~~Especially advantageously, the~~The horizontal extension arm ~~is~~may be divided into a rigid base arm at the sea side, a swivel arm joined to it at the sea side, and a rigid extension arm protruding at the land side; the rigid sea-side base arm and the rigid land-side arm are fastened to the vertical support, and the rigid sea-side base arm accommodates the sea-side hoisting and lowering device in the position of rest of the transfer plant, in which the sea-side swivel arm is swiveled upward.

Basically, the enhanced handling performance of the transfer plant ~~is~~may be accomplished in that the sea-side portion of the horizontal extension arm carries a railway for a trolley of the sea-side hoisting and lowering device, the land-side hoisting and lowering device is fastened at the land-side portion of the horizontal extension arm, and railways for the horizontal conveying devices are arranged on both sides next to the railway of the sea-side hoisting and lowering device and next to the land-side hoisting and lowering device and thus essentially along the entire horizontal extension arm.

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Please replace paragraph 8 on page 2 with the following amended paragraph:

~~In an advantageous~~another embodiment of the invention, the intermediate storage devices each comprise a downwardly extending support column, at whose lower end is attached a horizontal swivel arm, at whose end away from the support column is hinged a carrying frame, which can swivel both into the region underneath the sea-side or land-side hoisting and lowering device and into the region of the two horizontal conveying devices into corresponding pick-up and hand-off positions for the picking up or handing off of a container.

Please replace paragraphs 2-7 on page 3 with the following amended paragraphs:

On the other hand, ~~in advantageous manner~~ the swivel mechanism of the land-side carrying arm and/or the land-side carrying frame can be driven by a parallelogram type coupler mechanism, so that the orientation of the container remains unchanged during the swivel motion.

~~It is especially advantageous that the~~The carrying frame for the container can be swiveled into a central swivel position between the two pick-up and hand-off positions in the region of the railways, where the container can be connected to or detached from the sea-side or land-side hoisting and lowering device.

~~In an advantageous~~another embodiment, the horizontal conveying devices may each consist of a frame with a rail traversing mechanism that can travel on the railways, a hoisting mechanism and a spreader to receive the container which has been swiveled and positioned underneath the spreader.

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A stable guidance of the hoisting beam of the land-side hoisting and lowering device ~~is~~may
be accomplished in that it is configured as a lift guided on the vertical support. This lift
consists of a trolley, guided on a horizontal hoisting beam, with a load suspension means for
the container, the hoisting beam being suspended from hoisting cables and linked by a cross
rail to guide rollers that can roll against the vertical support.

To at least partly compensate for the natural weight of the land-side hoisting and lowering
device, the hoisting cables of the land-side hoisting and lowering device ~~are~~may be coupled to
a mobile counterweight.

As the interface to a horizontal conveying system, a loading station may be provided that is
arranged beneath the land-side hoisting and lowering device, having two pick-up and hand-
off positions that can travel alternately underneath the hoisting and lowering device.

Please replace paragraphs 5-7 on page 4 with the following amended paragraphs:

The method of the invention ~~is~~may further be characterized in that the container oriented
transversely to the lengthwise axis of the extension arm when picked up by the first hoisting
and lowering device is swiveled into a predetermined position parallel to the extension arm
by the carrying arm and/or carrying frame swiveling through $\pm 90^\circ$. As already described
above, this orientation is useful for the exact positioning of the container, for example, with
the container door facing the land side.

In another ~~favorable~~ configuration of the invented method, it is proposed that the container
oriented parallel to the extension arm when placed on the carrying frame of the second
downwardly extending support column does not change its orientation when swiveled into the
region of the vertical device due to opposite movements of the carrying arm and carrying
frame.

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Where the unloading of containers with the transfer plant of the invention has been described with the above features and work steps, it is expressly pointed out that ~~the essence of the~~ present invention may also extend to performing the above-described works steps in the reverse sequence in order to load a ship with containers.

Please delete paragraph 10 as follows:

~~This shows:~~

Please insert the following heading on page 4, before paragraph 11, and replace paragraphs 11-18 with the following amended paragraphs as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1, is a side view~~is a side view~~elevation of the~~a~~ transfer plant according to the invention,

Figure 2, is a top plan view of the transfer plant,

Figure 3, is a front view of the transfer plant,

Figure 4, is a back view of the transfer plant,

Figure 5, is a cutout from the side view at the vertical conveying device,

Figure 6, is a top plan view of the vertical hoisting device,

Figure 7, is a detail from Fig. 1,

Figure 8, is a detail from Fig. 3,

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Please replace paragraphs 1-5 on page 5 with the following amended paragraphs:

Figure 9, is another detail from Fig. 1,

~~Figure~~ Figures 10a, b, are respective diagrams of the swivel mechanism and the swivel process,

Figure 11, ~~diagrams~~ is a diagram of the swivel mechanism and the swivel process,

Figure 12, is a back view of the transfer plant, and

Figure 13, is a drawing of the crane out of operation.

Please insert the following heading on page 5, before paragraph 6 as follows:

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows a transfer plant 1 with a container ship 3 lying at dock 2. The transfer plant 1 consists primarily of a gantry 1.1, which rests on the dock by four multiple-wheel rail traversing mechanisms 1.2, a tower type vertical support 1.3, and a horizontal extension arm 1.4, 1.5 and 1.6, fastened to it. This extension arm consists of a rigid base arm 1.4 at the sea side, a swivel arm 1.5 mounted on it at the sea side, and a rigid extension arm 1.6 at the land side.

Please replace the first full paragraph on page 6 with the following amended paragraph as follows:

Figure 4 shows the transfer plant 1 in rear view, i.e., looking from the dock 2 out to sea, showing essentially the vertical hoisting device 13 with the swivel mechanism 14. Here as well, one can notice a spreader 22, which serves to pick up another container 21 and is suspended via a trolley 23 to a hoisting beam 13.1 of the vertical hoisting mechanism 13. The

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trolley 23 can travel along the hoisting beam 13.1. The hoisting beam 13.1 is attached via load cables 24, which are not guided in the region of the upper end of the vertical support 1.3, to a hoisting unit (not shown), arranged on the cross beam 1.7. A stable guidance of the hoisting beam 13.1 is provided by the two guideways 25, which run vertically and parallel to the vertical support 1.3. The swivel mechanism 14, like the swivel mechanism 12, consists of a support column 14.1, including a swivel unit, a swivel arm 14.2, and a carrying frame 14.3 for the container 21. The construction and mode of operation of the swivel mechanism 14 concur with that of the swivel mechanism 12. Therefore, we refer here to the corresponding description of the swivel mechanism 12. In the present drawing, the swivel arm 14.2 and the carrying frame 14.3 loaded with the container 21 are in the 0° position, i.e., parallel to the lengthwise axis of the transfer plant 1. One also notices here the two loading stations 15 and 16 on the dock 2 underneath the vertical hoisting device 13, as well as an FTF 17 hauling away the container 18.

Please replace paragraph 4 on page 6 with the following amended paragraph as follows:

Figure 5 shows a twin-lift operation with two 20-foot ISO containers. The trolley 23, outfitted with a rail traversing mechanism 23.1 for a short horizontal extension of around +/- 25 ft., is located in an off-center position above the 20-foot containers 26.1, which are stored in a 45-foot grid. The spreader 22, telescoped to the 20-foot stop setting, is ready for the first handling operation. In the next hoisting operation, the second 20-foot container 26.2 will be handled. The container loading stations 15 and 16, as a load hand-off mechanism, form the interface between the vertical hoisting device 13 of the transfer plant 1 and ~~in the horizontal conveying system by means of FTFs~~ the horizontal conveying system. The container loading stations 15 and 16, consisting of a chassis 15.1 or a chassis ~~16.2~~ 16.1 and two rail traversing mechanisms 15.2 and 16.2 apiece, can travel horizontally on rails 27, which are laid on the dock 2 in parallel with the rails 28 of the transfer plant 1.